

# Different Business and Consumer Usage Shaping Wide Area Networks

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## Agenda

- Research Focus
- Consumer Network Topology
  - Traditional View
  - Actual Usage
- Business Network Topology
  - Traditional View
  - Actual Usage
- Summary and Conclusion

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## Research Focus

### Network topologies: Traditional view versus actual situation

<i>Consumer</i>	Peer-to-peer network topology as result of data sharing among individuals?
<i>Business</i>	Hierarchical network topology as result of data access from central locations?

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## Agenda

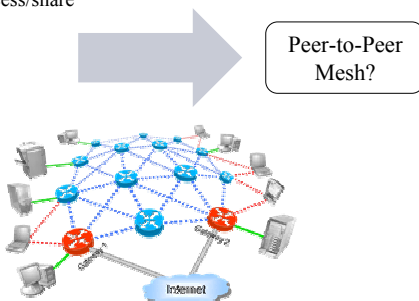
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## Consumer Network Topology - Traditional View -

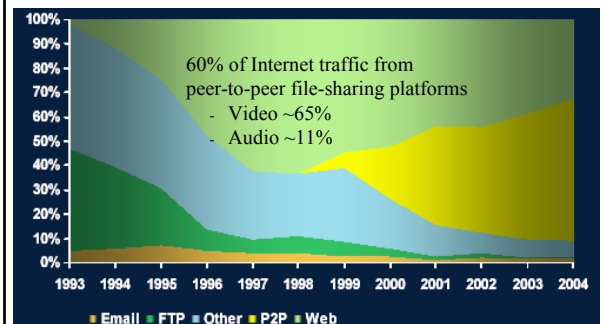
Consumers access/share objects P2P

- Video
- Music
- Etc.



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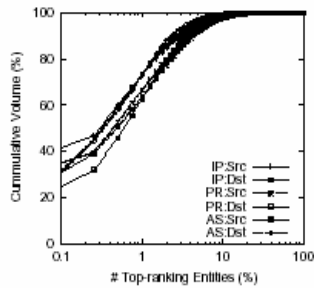
## Consumer Network Topology - Impact of Peer-to-Peer Traffic -



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## Consumer Network Topology - Peer-to-Peer Systems -

- 0.1% of servers transmit ~30% traffic
- 1% transmit ~70%
- 3% transmit ~90+%
- Few central servers
- Many clients



Statistically hierarchical

(Source: Sen, Wang 2004).<

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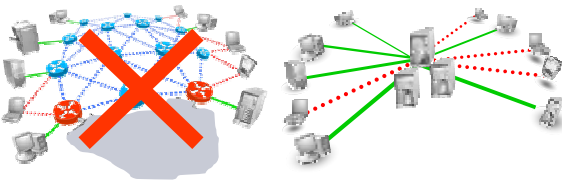
## Consumer Network Topology - Heavily Used Servers -



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## Consumer Network Topology - Actual Situation -

Consumers DO access/share objects with each other  
BUT via **Hierarchical Topology**



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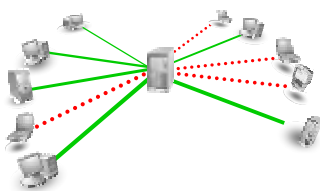
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## Business Network Topology - Traditional View -

Employees access data/content from headquarters

- Databases
- Messaging
- SaaS

Hierarchical Connectivity?

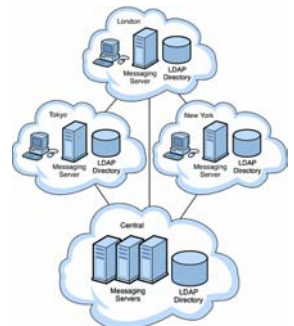


- Information access from large central databases?
- Very small data transfers?
- Not much network traffic?

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## Business Network Topology - Applications -

- Distributed storage servers
- Distributed application servers
  - Email/Messaging
  - Backup
  - Sales automation
  - ERP
  - SaaS / hosting not large (Top 10 < \$1 Billion (IDC))
- File accelerators



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## Business Network Topology

### - Usage Issues -

- Slowness - Latency
  - Opening files from central sever - not workable
    - Many interactions end-to-end to open file
  - CAD files, project files, database access
- Network Interruptions
  - Decrease in service
  - Issue of down time
- Time Zones: Need to work locally 24 x 7

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## Business Network Topology

### - Latency Issue -

**Absolute limit (speed of light/electrons)**

Latency unrelated to bandwidth  
(Regardless of Moore's Law)

e.g.,

London: 50ms from New York;  
California: 90ms from Atlanta

**Crossing boundaries ➔ More 'hops'**

Send side:

Server & routers

Network effect:

Routers

Receive side:

Server & routers

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## Business Network Topology

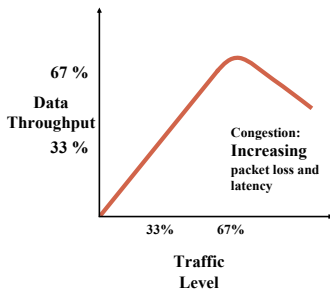
### - Reasons for Distributed Network -

Slowness - Congestion

- Simultaneous TCP sessions interacting
- Peaks synchronizing
- Buffering smoothes but adds latency

Hardware is *cheap*

- Servers
- Storage
- Routers
- Accelerators
- Mirroring software



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## Business Network Topology

### - Drivers of Distributed Topology-

- Low latency = Fast access
- Control of storage (remote server vs. many PCs)
- Predictable/ reliable exchange - within & across organizations
- No network downtime
- Inexpensive bandwidth & gear

riverbed

CISCO

PACKETEER

Silver Peak

Avail

EXPAND networks

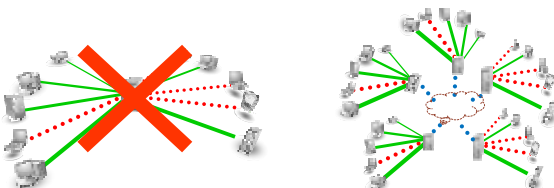
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## Business Network Topology

### - Actual Situation-

Business DO access/share objects with each other  
(files, data)

**In a Distributed Office Topology**



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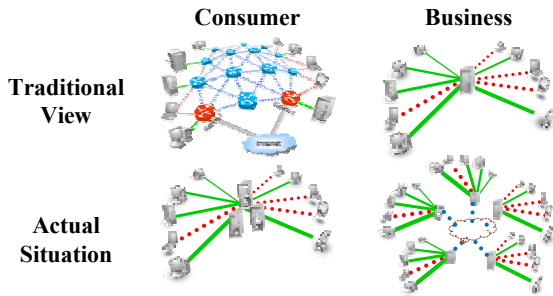
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## Summary of Findings

### Network Topology



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## Conclusion

- Consumer
  - Identifiable central server / *hierarchical* model (even for P2P)
  - Drivers: Value of product & bandwidth cost
- Business
  - Distributed *point-to-point* model
  - Latency metric for QOS
  - Primary importance: Monetization
  - Drivers: Latency & cheap hardware

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**Thanks for your attention !**

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